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ABSTRACT

The underlying constructs for an experimental battery (EB) consisting of artistic judgment tests--the Design Judgment Test (DJT), the Visual Designs Test (VDT), Proportion Appraisal (PA), and the Visual Aesthetic Sensitivity Test--were studied. Scores for 1,686 clients of the Johnson O'Connor Research Foundation's aptitude-testing service were correlated with 24 tests in the Foundation standard battery, an artistic background questionnaire (ABQ), and the Career Occupational Preference System interest scales. In addition, the tests were analyzed for their relationships with examinees' college major and years of education, and measures of laterality. The results indicate that the EB was largely independent of the aptitudes tested by the Foundation battery. A regression of the EB on the standard battery showed little common variance. However, modest correlations between the artistic judgment tests and several aptitudes were found. Data from the ABQ indicated that the DJT, the VDT simplicity scale, and the PA consensus scale were significantly related to participation in art-related activities. These measures also showed significant relationships with interest in art occupations. Artistic judgment scores of examinees who majored in art differed significantly from those of non-art majors. Little relationship between scores on the EB and years of education was found. The DJT, VDT simplicity scale, and PA consensus scale show broad associations with art criteria, are largely independent of education, and are not highly related to other aptitudes. Thirteen data tables, 5 figures, and an 88-item list of references are included. Appendix A provides the coding system for the ABQ, and Appendix B presents correlations not corrected for attenuation. (Author/RLC)

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ARTISTIC JUDGMENT II:

CONSTRUCT VALIDATION

Nikolaus Bezruczko

and

David H. Schroeder

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Artistic Judgment Project II: Construct Validation

Nikolaus Bezruczko and David H. Schroeder

ABSTRACT

An investigation was conducted into the underlying constructs for an experimental battery consisting of the Design Judgment Test, the Visual Designs Test, Proportion Appraisal, and the Visual Aesthetic Sensitivity Test--tests that measure aspects of artistic judgment. Scores from 1,686 examinees were correlated with 24 tests in the Foundation standard battery, an artistic background questionnaire, and the COPS interest scales. In addition, these tests were analyzed for their relationships with the college major of examinees, their years of education, and measures of laterality.

The results indicate that the experimental battery is largely independent of the aptitudes tested by the Foundation battery. A regression of the experimental battery on the standard battery showed little common variance (all *R*-squared values $< .12$). Modest correlations between the artistic judgment tests and several aptitudes, however, were found.

An analysis of responses to items on the artistic background questionnaire indicated that the Design Judgment Test, the Visual Designs Test Simplicity scale, and the Proportion Appraisal Consensus scale were significantly related to participation in art-related activities. These measures also showed significant relationships with interest in art occupations.

Analyses of college major and years of education showed that artistic judgment scores of examinees who majored in art differed significantly from scores of non-art majors. The differences between college-major groups ranged up to almost one standard deviation. After controlling for age, an analysis showed little relationship between scores on the experimental battery and years of education.

In conclusion, this study shows that three of the measures in the experimental battery--the Design Judgment Test, the Visual Designs Test Simplicity scale, and the Proportion Appraisal Consensus scale--show broad associations with art criteria. In addition, they appear to be largely independent of education and not highly related to other aptitudes. Recommendations were made to clarify the meaning of these tests as aptitude measures by studying them with samples of professional artists and school children.

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INTRODUCTION

Background

Since the early 1930s, the Johnson O'Connor Research Foundation has studied tests in an area called artistic judgment. Tests in this area generally involve judgments of preference between specially constructed visual designs, and these tests are intended to measure traits related to performance in the visual arts. Outside the Foundation, considerable research has been conducted in this area (see Technical Reports 1988-1 and 1989-2), and the Foundation has recently undertaken a program of study to evaluate the suitability of these tests for the Foundation's aptitude testing program. Toward this end, Nikolaus Bezruczko has reviewed the empirical research regarding visual preference judgments and artistic judgment testing (Technical Report 1988-1) and devised a research plan (Statistical Bulletin 1986-5) to collect data for a study of responses by Foundation examinees to items on several tests.

The primary aim of this program of research, undertaken by the Foundation, is to empirically evaluate the reliability and validity of four tests designed to measure differing aspects of artistic judgment. The tests are: the Design Judgment Test (DJT), the Visual Designs Test (VDT), Proportion Appraisal (PA), and the Visual Aesthetic Sensitivity Test (VAST). The DJT consists of pairs of designs that contrast symmetrical with asymmetrical designs. The VDT presents examinees with random patterns that differ in their complexity and order, while PA presents shapes that differ in their proportions. The VAST is an objective test of the ability to identify designs with harmony and balance. In previous reports we have presented the historical background for these tests, and in the Measures section of this report, we review their technical characteristics.

In the first of three technical reports, *Artistic Judgment Project I: Internal-Structure Analyses* (Technical Report 1989-2), we presented the results of an internal psychometric analysis of these artistic judgment tests. In the present report, we present the relationships between these tests and the following external criteria: (a) the cognitive ability tests in the Foundation standard aptitude battery; (b) the items in an artistic background questionnaire; (c) the scales on an occupational interest inventory; (d) choice of college major; (e) years of education; and (f) eye and hand dominance scores. In the next report in this series, we will present the results of a validation study of these tests with professional artists.

In the sections below, we first summarize the results from the psychometric analyses reported in Technical Report 1989-2. Then we review the research literature for empirical studies that have investigated the constructs that underlie these artistic judgment tests. We review the current thinking of researchers

concerning artistic judgment as an aptitude and we speculate on the implications of this research for the artistic judgment tests in this study. Next we discuss the goals and expected results of the construct validation analyses to be reported here. The Method, Results, and Discussion sections for this report then follow.

Summary of Internal-Structure Analyses

In Technical Report 1989-2, we presented item difficulties, item-total correlations, reliabilities, item factor analyses, and Rasch item fit *t* values for each of the four tests of artistic judgment. In addition, we examined correlations between the total test scores and sex and age effects.

The item factor analyses indicated that a single factor (with varying degrees of residual variation) generally characterized the item variance for each of these tests, respectively, except for the VDT. The VDT, an experimental test newly designed for this series of studies, showed two factors that we developed into separate scales. We interpreted scores on the first VDT factor as representing the preference for less-complex designs and scores on the second factor as preference for more-uniform designs. Consequently, we named the scales Simplicity and Uniformity.

We found the DJT and the two VDT scales to have the highest alpha reliabilities of the group, .89, .95, and .88, respectively. The reliabilities for PA, when scored by two methods (namely, consensus of opinion and preference for shapes with a ratio of width to length of .67), were .76 and .78, respectively. We named the PA scales PA-Consensus and PA-.67.

The reliability for the VAST appeared low, .66, although we speculated that the use of printed items rather than photographic slides may have influenced item performance. Since the publication of *Artistic Judgment Project I*, we have also reviewed articles by Arnheim (1957) and Sakurabayashi (1953) indicating that patterns of visual preference, such as for designs with balance and harmony, may shift over the course of a testing session. Because the VAST was originally based on a group administration of photographic transparencies, with fixed presentation times, while the examinees in this study formed their preferences individually without any time constraint, we speculate that differences in the administration of the items could have influenced the internal consistency of the VAST.

An analysis of item-total correlations and Rasch item fit *t* values for these tests indicated that, for some items, the responses of some persons were not consistent with the difficulty values of the items. Although these inconsistencies were not major, they entered into our recommendations for improving the tests.

In an analysis of sex and age effects, we found significant main effects for age for VDT Simplicity and the VAST and significant sex and age effects for the

DJT, VDT Uniformity, PA-Consensus, and PA-.67. In general, these results indicated that, relative to males, females have a greater preference for asymmetrical designs and a slight tendency to show preferences for shapes that match the general consensus of examinees. The age effects for VDT Simplicity and Uniformity, respectively, indicated that the preferences for less-complex and more-uniform designs increase with age.

Intertest correlations for these four artistic judgment tests, in decreasing order of magnitude, were (a) VDT Simplicity and the DJT (.30); (b) the DJT and PA-Consensus (-.28); (c) the DJT and VDT Uniformity (-.25); (d) the VAST and PA-.67 (.19); and (e) the VAST and PA-.67 (.13). As we expected, these correlations indicate that these tests do not share a large common factor, but appear to measure independent aspects of visual preference. These results are consistent, however, with a theoretically meaningful perspective described by other researchers (Eysenck, 1940, 1941a, 1957, 1968, 1971; Eysenck & Castle, 1971; O'Connor, 1940, 1948).

Eysenck (1981, 1988), for example, found that preference for visual designs appears to form several factors, two of which he labels *T* and *K*. The *T* factor represents visual preferences supported by a wide consensus (i.e., artists and nonartists agree), whereas *K* represents a dimension on which the preferences of artists and nonartists differ (Eysenck, 1972a; Eysenck, 1941a). We found that the VAST, a test designed to measure Eysenck's *T* factor, showed its highest correlation with PA-Consensus, a scale that measures agreement with consensus judgments regarding the attractiveness of shapes. This relationship supports a general aptitude position on artistic judgment and is consistent with O'Connor's (1948) perspective regarding a global capacity for sensory sensitivity.

We also found that VDT Simplicity, a scale conceptually related to Eysenck's *K* factor, showed its highest correlation with the DJT, a test that has been validated with artists (Eysenck, 1972a). This relationship suggests that VDT Simplicity, an experimental scale, measures a pattern of visual preference, liking for less-complex designs, that characterizes the preferences of some artists.

Our analysis of internal consistency also indicated that we have discovered another preference factor, not previously discussed in the literature. The negative relationship between VDT Uniformity and the DJT suggests that artists may prefer designs with less uniformity.

Construct Validation Research on Artistic Judgment

Speculation on an Art Construct

Researchers have long speculated on an underlying construct for art ability, and the particular association that art aptitude, and specifically artistic judgment, has with it. Meier (1928, 1942) proposed a broad model in which art ability consists of five components: intelligence, perceptual abilities, sensitivity to composition, and manual skills and dexterity related to the production of art objects. He believed that the component involving a person's sensitivity to composition underlies all art ability and is especially important for artistic judgment. Several decades later, Berlyne (1971, 1974) offered a similar perspective, in the context of information theory, that emphasized the person's reaction to the spatial configuration of elements in a design as a fundamental component of all art ability.

Other researchers have viewed artistic judgment as a general aptitude that underlies a wide range of sensory preferences. Burt (1933) presented evidence to support this view, as did Dewar (1938) and later Granger (1955). Eysenck (1940, 1941a, 1941b) demonstrated the generality of this approach, presenting evidence for a general factor that extends across several perceptual modalities and many tests of preference.

Central Issues

Researchers investigating the validity of artistic judgment tests have raised several questions. They include the following:

1. Does empirical evidence support the concept of artistic judgment as an independent aptitude?

2. How effectively do these tests distinguish artists and nonartists?

3. What is the association between artistic judgment and intelligence?

4. Do tests of artistic judgment measure capacities that are independent of training and experience? and.

5. What is the association between artistic judgment test scores and other mental or personality characteristics?

Methods of Validation

The investigation of validity, for tests of artistic judgment, has relied on several empirical methods. These include the correlation of test scores with: (a) expert judgments of a person's artistic production(s), (b) teacher ratings of art ability, and (c) consensus scores--agreement of a person's preferences with the preferences established by the majority of a sample. In addition, methods have been developed that: (a) examine the correlations between artistic judgment tests, (b) compare test scores between artists and nonartists, and (c) examine test scores across age groups. Several of these methods are discussed below.

Correlation of test scores with ratings of production or ability. This method of validating artistic judgment tests is based on the view that production of art objects requires the ability to form high-quality artistic judgments. Consequently, persons who produce objects of fine art should receive higher scores on tests of artistic judgment than persons who do not.

Correlation with consensus scores. The method of consensus, in its various versions, is based on a view that broad cultural agreement, sometimes established by art experts and other times by lay persons, is the foundation on which standards of preference, for society, are formed and maintained. While cultural values and opinions may change to some extent, this perspective assumes that society shares a consensus regarding visual preference that, to a great extent, transcends time and fashion, thus providing a stable basis for validating artistic judgment tests.

McAdory (1929) was one of the first researchers to develop and apply a method of consensus that compared item responses to the preferences agreed upon by a group of professionally trained art experts. Meier (1928, 1942) developed an approach to validation, also based on consensus, that assumed the importance of principles of good aesthetics agreed upon by most persons. He then developed a test that consisted of items that contrasted reproductions of authentic artwork, based on these principles, with reproductions that were altered to show poor design. Eysenck (1957) used a model for consensus based on the agreement among lay persons in a sample, when they indicate their preference between designs in a test item, an approach also employed by the Foundation for Proportion Appraisal.

Comparison of age groups. Another method that researchers have applied to validating artistic judgment test scores is the examination of test scores across age groups. This approach is based on the expectation that a test of artistic judgment should show increases in the mean values of test scores across examinees in the younger groups but a general leveling off for examinees who are adults. This

pattern is evidence that test scores, to some extent, may be related to spontaneous human development, thus not entirely the result of training or education. Because a person's background influences test scores, this method has also been the basis for examining the influence of education and social background on test scores. Some studies, for example, have subdivided age groups according to educational and social characteristics, thus permitting the comparison between test scores and background.

Application of Methods

Over the course of the twentieth century, many studies have applied these methods of validation to tests of artistic judgment. Crannell (1953), for example, examined the association between test scores and ratings of ability on a drawing task. Barrett (1949), Child (1964), and Bolton (1955) examined the association between test scores, school achievement, and intelligence. Eysenck (1940, 1941a, 1941b) and Dewar (1938) relied on factor analytic methods to support a factor model for artistic judgment, while Graves (1946) and Eysenck (1972a) examined differences in scores between artist and nonartist groups. Rump (1977) examined correlations between the Design Judgment Test, interest in art, and art achievement, while McAdory (1929), Carroll (1933), and Eysenck (1972b) studied the trends of scores across ages.

Results

As a whole, these studies indicate that artistic judgment tests discriminate between artists and nonartists, but researchers do not fully understand the tests' underlying constructs. Studies show that artistic judgment test scores, age, and amount of training are associated, although the influence of education appears weak. Eysenck (1972b), for example, reported that scores on the Design Judgment Test do not change much after 9 years of age and that differences between art-trained and non-art-trained persons were very small--less than one point on an 11-point scale.

Despite considerable research, the evidence for a general factor underlying preference is mixed. Eysenck (1940) and Granger (1955) presented evidence supporting a general factor, while Child's (1964) research showed mixed results. As noted earlier, we found the four artistic judgment tests that we have studied to be largely independent of each other (Technical Report 1989-2). This issue, whether artistic judgment tests measure specialized abilities or represent differences in a general aptitude, remains unresolved.

Researchers have found that artistic judgment tests consistently correlate with (a) intelligence, (b) spatial and visual abilities, (c) several personality variables, and (d) external art-related criteria such as hobbies, interests, and art awards.

These relationships, however, while suggestive of associations between other variables and art ability, are generally weak and should be examined further.

Some investigations indicate that art ability, while mostly independent of intelligence, is fundamentally linked to the development of cognitive abilities. Arnheim (1986) and Ecker (1963) emphasized an association between art ability and problem solving. Csikszentmihalyi and Getzels (1988) presented evidence that artists extract order and meaning from the artistic problems they pursue. This perspective suggests that artistic judgment, through its association with art ability, may have a fundamental association with intellectual processes, although the extent to which this aspect of artistic judgment is independent of intelligence, if at all, is unclear.

In studies of brain function and aesthetic preference, Levy (1976) found that college students prefer pictures in which the dominant elements are on the right side. Other researchers (Davidson, 1984; Heller, 1988; Heller & Levy, 1981) have found that emotional responses to pictures are linked to the location of the dominant content. Freimuth and Wapner (1979) found that the predominant direction in an image--e.g., from left to right--also influenced preference. When dominant content was on the right side, per Levy (1976), they found that lateral movement from left to right was a major determinant of preference. Freimuth and Wapner (1979) also found that evaluation of art works is influenced by the amount of time provided for viewing. During brief exposures (5 seconds), preference appeared to be based on the lateral organization of the works, but with exposures of 20 seconds, preference was based on a content interpretation of the works, suggesting that the visual analysis of stimuli is organized temporally.

Limitations in Previous Studies

The interpretation of studies that investigate the construct validity of artistic judgment tests is clouded by several limitations. First, many of the studies relied on samples, frequently of small size, that consisted primarily of college students from a single college or university. Consequently, the extent to which results from these studies are influenced by local culture, an important concern in the area of artistic judgment, is difficult to establish. Moreover, the restricted range of ages characteristic of many of these studies, for all practical purposes, prohibits the assessment of these tests as measures of an aptitude.

Second, these studies of validity oftentimes relied on external art-related criteria as a basis for establishing validity that, in retrospect, may not always be accurate. For example, ratings of art products (Crannell, 1953) and the ratings by expert art judges selected on the basis of enrollment in a professional art organization (McAdory, 1929) are instances of external criteria that are not clearly related to artistic judgment. The link between artistic judgment and art production

is ambiguous. Persons high in artistic judgment may not have any interest in producing art objects, and thus the association is indirect at best. Likewise, the criterion for identifying an art expert, enrollment in a professional organization, while art-related, may not involve a substantial degree of artistic judgment. Consequently, the basis for validating artistic judgment tests in earlier studies is not always convincing.

Goals for This Study

Previous studies have shown low positive correlations between tests of artistic judgment, measures of academic achievement (see Technical Report 1989-2, pp. 7-8), and art background (Child, 1965). Our intent in this study was first to replicate these relationships and second to focus on the systematic relationships between these tests and additional external criteria, thus supplementing the construct validity research conducted by other researchers. While our previous research with these tests established that persons differ in their preferences for designs that vary in complexity, symmetry, proportion, and balance and harmony, our intent in this study was to evaluate whether these isolated aspects of preference have significant relationships with artistic background, occupational interests, and cognitive aptitudes. Also, because this study involves a sample of examinees much larger than most previous studies and with a greater range of ages, from across the United States, we expect our results to provide important insight into the generality of the association between artistic judgment tests and external criteria.

For these reasons, we examined the association of four artistic judgment tests (Design Judgment Test, Visual Designs Test, Proportion Appraisal, and Visual Aesthetic Sensitivity Test) with (a) the Foundation's standard aptitude test battery, (b) an artistic background questionnaire, (c) the scales on an occupational interest inventory, (d) the years of education completed by examinees; and (e) examinees' choice of college major, categorized into fine art, business art, and non-art.

Our expectation, based on our review of the literature and prior Foundation research, was that we would find a pattern of association between scores on these tests and the external criteria we selected for validating them. According to previous research, we did not expect the tests to show strong correlations with the Foundation battery, confirming that the tests are largely independent of cognitive aptitudes.

We also expected the test scores, in general, to show significant positive correlations with items on the artistic background questionnaire and the art scales on the occupational interest inventory. Persons with backgrounds in art, such as training or employment, were expected to show high scores on the Design Judgment Test, the Visual Designs Test Simplicity scale, and the Visual Aesthetic

Sensitivity Test and low scores on the Visual Designs Test Uniformity scale and Proportion Appraisal when it is scored for shapes with .67 proportions.

A relatively new area of research that this study will address is the relationship between laterality and artistic judgment. Researchers generally agree that the brain functions asymmetrically with language performance centered in the left hemisphere for most right-handers. The right hemisphere predominantly emphasizes "visuo-spatial tasks, including spatial relations, spatial location, visual matching, face recognition" (Levy, 1976, p. 432). Some researchers characterize left hemisphere functioning as analytical and logical and right hemisphere as holistic and emotional. Researchers tend to distinguish between the patterns of brain orgainization associated with language performance and artistic activity, respectively (Schwieger, 1985). Following from this, it is possible that artists and nonartists with art aptitude will show different patterns of hand and eye dominance than will other persons.

Given the asymmetrical function of the brain, specifically the specialization of visual perception in the right hemisphere, one might expect that artists would show dominance of the right hemisphere. Freimuth and Wapner (1979), in their study of lateral organization and the evaluation of paintings, speculate that if this "asymmetry is biologically based on lateralization of hemispheric functions, then handedness (as a measure of cerebral organization) would be expected to be related to variations in perceptual asymmetries" (p. 217).

Based on studies of brain lateralization, we expect that the cerebral organization of artists and nonartists will differ and that straightforward tests of hand and eye dominance will show associations with scores on the artistic judgment tests. Because the stimuli in the tests are designed to minimize the influence of semantic content, thus minimizing functions in the left hemisphere, and do not require physical manipulation by the examinee, we expect a systematic association with eyedness to a greater degree than handedness.

We now describe the method and report the results of this study of construct validity.

METHOD

Examinees

The examinees in this study were clients of the Foundation's aptitude-testing service, who paid a fee to receive aptitude evaluation, generally for educational and occupational planning. After giving consent, they completed, along with the

standard Foundation battery, a set of experimental artistic judgment tests.

A total of 1,686 examinees completed one or more of the tests in the artistic judgment battery. Of these examinees, 53.4% were male and 46.6% were female. The age of the examinees ranged from 14 to 54 years with an average of 26 years (*SD* = 10.04). The median age was 22 years, indicating a moderate skewing toward older examinees. Racially and economically, examinees tended to be white and middle to upper-middle income. Most of the examinees were college-educated or college-bound.

Geographically, 482 of the examinees were tested in Foundation offices in the eastern United States (28.6%), 870 examinees were tested in southern Foundation offices (51.6%), and 334 of the examinees were tested in western offices (19.8%).

Measures

The measures analyzed in this study were: (a) the standard Foundation aptitude battery, (b) four experimental artistic judgment tests, (c) the Career Occupational Preference System (COPS), an interest inventory that examinees complete in conjunction with the Foundation test battery, and (d) a questionnaire assessing training and experience in visual artistic areas. A description of these measures is given next.

The Standard Foundation Aptitude Battery

The standard Foundation battery consists of 23 standardized tests. Twenty of the tests are aptitude tests that the Foundation has developed to measure 19 distinct aptitudes related to occupational and educational experience. (Two tests, Wiggly Block and Paper Folding, measure the same aptitude--structural visualization.) Table 1 lists the reliabilities and the aptitudes measured by these tests. The validity of the aptitude tests is supported by the many years of research reported in the Foundation's technical reports (see, e.g., Technical Report 1983-2 for intertest correlations and Technical Report 1983-6 for a validation study of physicians). The other three tests in the standard battery measure other qualities related to occupational and educational performance: English Vocabulary, Mathematics Vocabulary, and reading ability.

Artistic Judgment Experimental Battery

Four artistic judgment tests were administered: (a) the Design Judgment Test (DJT), (b) the Visual Designs Test (VDT), (c) Proportion Appraisal (PA), and (d) the Visual Aesthetic Sensitivity Test (VAST). Description of the tests, their method of scoring, their technical characteristics, and sample items from the tests follow below.

Table 1

Aptitude Tests in the Standard Foundation Battery

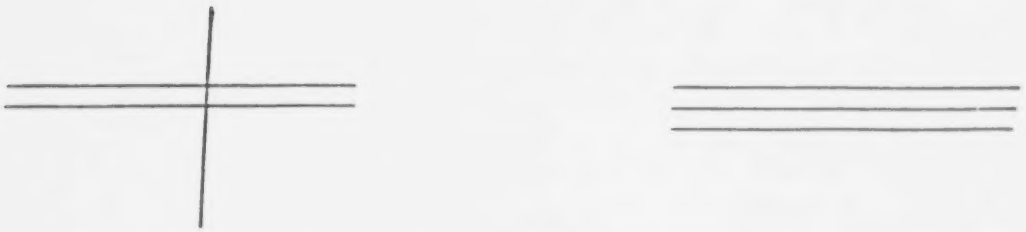
Test	Relia.	Description
Number Checking	.96	Speed and accuracy in noticing if pairs of numbers are the same or different.
Color Perception	NA	Ability to perceive colors across the color spectrum.
Ideaphoria	.97	Measure of verbal fluency, the rate of flow of ideas.
Foresight	.97	Ability to keep one's mind on a long-range goal.
Inductive Reasoning	.84	Quickness in seeing a common element among separate facts, ideas, or observations.
Analytical Reasoning	.65	Quickness in arranging ideas in a logical sequence.
Number Series	.87	Aptitude for using numerical information for solving problems.
Wiggly Block	.73	Measure of structural visualization, an aptitude for visualizing three-dimensional forms. Measured by the ability to reconstruct a three-dimensional block.
Paper Folding	.82	A second measure of structural visualization. Measured by the ability to rotate two-dimensional surfaces through three-dimensional space.
Personality	.89	Tendency to react from a general, objective viewpoint versus reacting from a personal, subjective viewpoint. Describes how well-suited a person is for work that is highly oriented toward person contact.
Tonal Memory	.92	Tests the ability to remember sequences of tones.
Pitch Discrimination	.80	Ability to differentiate fine differences in pitch.
Rhythm Memory	.73	Ability to remember complex rhythmic patterns.
Memory For Design	.80	Memory for straight-line patterns.
Silograms	.92	Associative memory for English words paired with nonsense syllables.
Number Memory	.82	Ability to remember several six-digit numbers simultaneously.
Observation	.62	Quickness in recalling fine visual details.
Finger Dexterity	.86	Speed and accuracy in manipulating small objects with one's fingers.
Tweezer Dexterity	.93	Speed and accuracy in handling small objects with tweezers.

Source for reliability coefficients: Statistical Bulletin 1988-2.

Design Judgment Test (Graves, 1948). Published in 1948, the DJT in its standard form contains 90 items. On each item, examinees are presented with two or three visual designs printed on a page in a three-color format, with black-and-white figures against a light green background. Examinees are directed to choose the one design from each group that they most prefer; that is, that they like the most. All but one of the designs on each item are intended by the test author (Graves, 1948) to violate basic principles of aesthetic order--"unity, dominance, variety, balance, continuity, symmetry, proportion, and rhythm" (Graves, 1948, p. 2). Examinee scores consist of the number of times their preference matches the choice considered to be artistically superior, (i.e., the choice that does not violate aesthetic principles). Graves reported test reliabilities ranging from .82 to .93, based on several samples of art students (Graves, 1948). He found that third-year illustration students scored 66.2 (*SD* = 3.18), while first-year engineering students scored 49.6 (*SD* = 3.90). Eysenck (1970; Eysenck & Castle, 1971), however, failed to replicate this finding in other samples. He also performed a factor analysis of the DJT and concluded that the 90 items do not form a unidimensional scale (Eysenck, 1967). He did find a 22-item subset of the DJT that is unidimensional, and he speculated that preferences on these 22 items may be associated with artistic judgment (Eysenck & Castle, 1971). Visual inspection of the 22-item subset of the DJT shows that the items consistently present choices between symmetric and asymmetric designs, with the keyed choice being the asymmetric design. Figure 1 presents an item similar to those in the subset.

Figure 1

Sample Item From Design Judgment Test



Examinees select the design they prefer.
The keyed choice is the design on the left.

Within the Foundation, earlier studies (Statistical Bulletin 1975-6; Technical Report 792) found a correlation of -.32 between a 13-item subset of the DJT and

Proportion Appraisal, indicating that high DJT scorers tend to prefer the more-elongated shapes on PA (Trembly, 1974).

To enable us to further evaluate its psychometric properties, the 22-item subset of the DJT was administered as part of the artistic judgment battery. (Henceforth, when we refer to the Design Judgment Test [DJT], we mean the 22-item subset that was included in the experimental battery.)

In our analysis of internal structure, we found that the reliability for the 22-item subset was .89 (Technical Report 1989-2). Item-total correlations ranged from .16 to .62 with a mean of .49, and a principal components factor analysis indicated that a one-factor solution is adequate for the test. Rasch item infit values indicated that all items except Item 4 (the first item on the test) fit the model requirements for linear measurement.

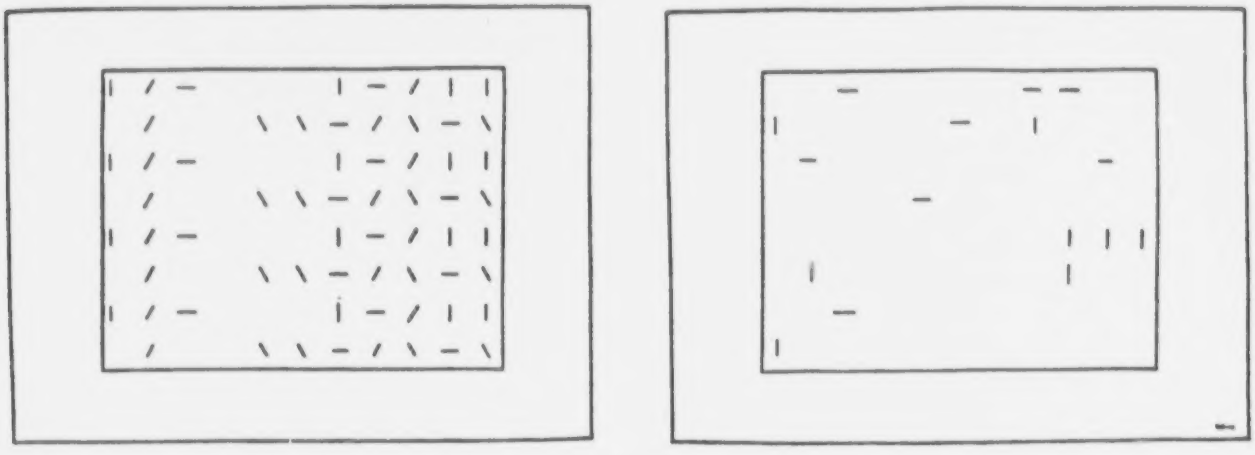
Visual Designs Test. The conceptual bases for the VDT are principles from visual perception and Gestalt psychology. In studies of perception, researchers have found that viewers organize visual stimuli into sub-units and over repeated exposures build up a percept (Haber & Hershenson, 1965) that corresponds to a verbal concept. This extraction of information from a visual image occurs instantaneously (Brighouse, 1939; Kellet, 1939; Külpe, 1903); Haber and Hershenson (1965) found that the process occurs with exposures as brief as five milliseconds, although the time necessary for forming a percept depends on the content of the image. Gestalt psychologists have argued against an elemental approach such as this to perception, although they too suggest that a viewer operates on an image by extracting its simplest structure (Koffka, 1935; Köhler, 1920). This principle of information extraction guided the development of the VDT, in which a visual image is conceptualized as consisting of a cell structure in which groups of cells function together to form patterns and designs. As a consequence, any manipulation of the cells that underlie an image changes the overall pattern, and possibly the preference for it. When one systematically constructs designs that differ in characteristics known to distinguish between artists and nonartists, these designs, when used as test items, should be effective in identifying persons with preferences similar to artists. On the basis of considerable previous research, complexity and order were the characteristics chosen for manipulation in the VDT.

This theoretical perspective was put into operation by means of a systematic design-construction program consisting of rules for the assignment of visual elements to randomly chosen locations within 8" x 11" visual fields (Technical Report 1988-1). Although programmed artwork (using in part explicitly random factors) has been developed by others (Attneave, 1956, 1957, 1959; Dorfman, 1965; Noll, 1966, 1972), researchers have not simultaneously manipulated complexity and order nor used designs of this type in individual-difference measures.

For the VDT designs, the total number of elements assigned to a visual field (similar to Birkhoff's operational definition of complexity, i.e, the number of sides of a polygon; see Birkhoff, 1956, for a discussion) determined the approximate complexity of a design, while manipulation of the repetition of a pattern in a design by 50 or 100% controlled the order. Designs with a great deal of repetition were considered to possess a high degree of order, while the absence of repetition resulted in totally random patterns. Our manipulation of order differs from the operational definition of other researchers (Garner, 1970) because our method does not result in a symmetrical pattern or mirror image for patterns with a high degree of order. Instead we follow a model presented by Attneave (1959) in which order is operationally defined by a pattern of repetition across a design. According to Attneave, this method should produce differences in persons' liking for a pattern, and thus we expect it to be useful in distinguishing between artists and nonartists. The complete item-construction specifications are given in Technical Report 1988-1 (pp. 36-37). Figure 2 presents two visual designs used in a VDT test item.

Figure 2

Sample Item From Visual Designs Test



Examinees select the design they prefer. The design on the left is constructed to be more complex.

In 1987, the Atlanta and Dallas offices presented two sets of 45 VDT designs each to examinees. The examinees rated the attractiveness of each design on a

scale of 1 to 5. The results indicated that greater complexity was associated with higher attractiveness ratings by lay persons for the designs, while order had a systematic effect only in its interaction with complexity.

Following on the rating-scale results, Bezruczko formed a forced-choice test presenting 84 pairs of designs (see Research Memorandum 1989-3) that contrast higher levels of complexity with lower levels of complexity. The respective levels of order were not controlled and thus vary from item to item. Examinees are instructed to select the design from each pair that they prefer. This version of the test, henceforth referred to as the VDT, was administered to the examinees in this study.

This forced-choice version of the VDT was administered to 1,686 unselected Foundation examinees in this study. Earlier factor analyses of these data (Technical Report 1989-2) indicated that the test has two major factors. The first factor (Simplicity) represents preference for simplicity over complexity in visual designs. The second factor, Uniformity, contrasts more-ordered and -uniform designs over more-disordered designs. Both factors were reliable: .95 and .88, respectively. The analyses and results presented in this report are based on responses to this forced-choice version of the VDT.

Proportion Appraisal (Worksample 235 C). Proportion Appraisal measures differences in preferences for proportions in visual designs. In this study we used the most recent version of PA, Worksample 235 C (Technical Report 44). This test consists of 50 items, each containing three simple geometric figures differing only in their proportions. For one figure in each item, the ratio of the width to the length is .50 (1:2); for another, .67 (2:3); and for the third, .75 (3:4). For one item (Item 50), we were unable to identify precisely the proportions. The ratio of .67 corresponds the closest of the three to the ratio of the golden section, a favored art concept, and tends to characterize the most-preferred figures on the test (Technical Report 99).

PA test directions instruct the examinee to select two figures from the three presented for each item, namely, the examinee's choices for best figure and worst figure. In the past, scoring of item responses was based on the "consensus of opinion of the general population" (O'Connor, 1940, p. 113), or the correspondence between an examinee's responses and the most common responses to items. According to O'Connor (1940), "The test selects men and women whose judgment of proportions conforms with that of humanity" (O'Connor, 1940, p. 111). This method resulted in some items with ratios of .67 as the keyed figure, while for other items .50 or .75 was the keyed choice and for other items the scoring rationale was unclear.

During previous use in the Foundation, Proportion Appraisal has been found to be moderately reliable (.70) and to correlate -.43 with the Design Judgment Test (Technical Report 792). Earlier Foundation research indicated that artists score low on the test (Technical Report 792) and Foundation writers have speculated that artists tend to prefer the elongated forms (ratio of .50; Trembly, 1974). This would suggest that persons who prefer more-elongated figures on PA will tend to prefer the asymmetric designs on the DJT.

In order to clarify the influence of proportions on preference, we created separate keys for .67 and consensus scoring. In the first of these scoring methods, the figure with the .67 proportions was keyed as having the best shape. Initially, examinees were given one point for each item on which they chose the .67 figure for the best. Then we gave examinees a point each time they chose the .50 figure as the worst shape (the .50 figures tended to be the most common choices for worst shape). We refer to this method of scoring, with .67 for best shape and .50 for worst shape, as ".67" scoring.

For the second scoring method, we relied on the obtained preference responses for each item. Rather than keying the .67 figure as the best shape and .50 as the worst shape on all items, we keyed whichever figures were most often chosen on each item as the best shape and the worst shape. Thus, examinees received one point for every choice for best that matched the group choice and one point for each choice for worst shape that matched the group choice. For this scoring method, several items were not scored for best or worst because there was no clear choice (i.e., no response given by more than 40% of examinees). We refer to this scoring method as consensus of opinion scoring (or simply consensus scoring). Figure 3 presents a sample PA item.

Previous validation research on PA indicated that it tends to be independent of the other tests in the Foundation battery. The highest correlations for PA reported in Technical Report 859 are .19 and .22 with Personality, which means that objective persons tend to choose the popular golden-section proportions, while subjective persons are more likely to prefer the more-elongated figures. The Foundation has speculated that artists also tend to prefer the elongated forms, although no documentation of empirical research on this is available. With regard to the other artistic judgment tests in this study, PA shows little correlation with the VAST or the VDT but correlates -.28 with the Design Judgment Test. This indicates that persons who prefer more-elongated figures on PA tend to prefer the asymmetric designs on the DJT.

In our analysis of internal structure (Technical Report 1989-2), the average item-total correlation for each method of scoring was .24. When we examined the item responses for consensus scoring and .67 scoring with a principal components factor analysis, we determined that both have one primary factor, with some

Figure 3

Sample Item From Proportion Appraisal

Which figure has the BEST shape?
Which figure has the WORST shape?

residual covariation. Alpha reliabilities for the two scoring methods were moderate (r_{π}s = .76 and .78, respectively).

Although the Rasch infit values for PA tended to parallel the item-total correlations, with low item-total correlations corresponding to larger infit values (i.e., greater misfit), eleven of the items misfit the model when PA was scored on the basis of consensus of opinion, while none of the items misfit the measurement model when the items were scored for the .67 proportion. The difference in infit values indicates greater consistency by examinees in their order of preference when PA is scored for the ratio .67, which is consistent with the slightly higher alpha reliability for this scoring method.

Visual Aesthetic Sensitivity Test (Götz, 1981). This test presents examinees with 50 pairs of nonrepresentational designs artistically rendered by an internationally renowned painter. The test developers produced the designs in each pair in such a manner that one of them is considered to have better harmony and balance, and the examinee is instructed to identify that design in each pair, as specified in the test instructions:

> Each pair consists of two quite similar pictures, one of which is superior from the point of view of design; *it is more harmonious, better balanced, and better adapted in the way the elements are ordered and in the way the lines are drawn*. . . . Your task will be to discover . . . which in each pair is the *better design*. (Götz, 1981, instruction sheet)

The test developer, K. O. Götz, argues that the keyed designs on the VAST are objectively "better" than their nonkeyed counterparts in terms of balance and harmony and that the test's validity is therefore independent of the styles and fashions of any particular point in time. In support of this position, he reports a review of the designs by eight professional artists (Götz et al., 1979). For all 50 items in the published version of the test, the eight artists agreed that the keyed design was better balanced and more harmonious than the nonkeyed design.

Examinees receive one point for each item on which their choice of the better design (in terms of balance and harmony) agrees with the key. Thus, examinees' abilities to identify balance and harmony are evaluated against the standards set by the test developer. It should be noted that the other artistic judgment tests studied here, in contrast, rely on personal reports of preference and do not ask examinees to make objective judgments of value.

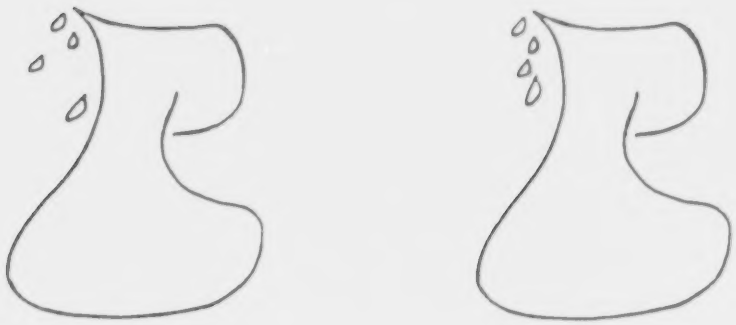
Visually, the VAST comprises two types of items. The first type of items contains simple concrete designs that generally appear as full shapes, oftentimes with rounded contours, although a few have sharp points. The designs in these items generally have little detail. The second group contains designs with broad sweeping brush strokes, sometimes producing an abstract circular motion. These designs are generally very complex, with an extensive amount of fine detail in the brush work. Figure 4 presents an item similar to the simple concrete type from the VAST.

According to Götz et al. (1979), photographic transparent slides of 42 of the 50 test items have been administered to groups of nonartist adults and found to have a reliability of .84. The present study used a printed version of the VAST, in which the designs are reproduced as duotone (black and white) prints. Visual differences between projected slide images and two-dimensional print copy may influence the test's psychometric properties. In particular, the highly detailed features of the brush-stroked items may not be as apparent in the printed version as in the slide version, thus influencing preferences.

Our earlier analysis of internal structure (Technical Report 1989-2) indicated that the test tends to be relatively easy for examinees, although p values for two of the items were close to the guessing level for this test. Item-total correlations were generally low, ranging from .00 to .30 with a mean of .17. In a principal components factor analysis, we found one primary factor for the VAST with residual covariation.

Figure 4

Item Similar to the Items on the Visual Aesthetic Sensitivity Test



The design on the right is the better of the two designs in terms of balance and harmony.

The reliability for the VAST was low, .66. Based upon an analysis of item-total correlations, we formed subsets of VAST items and found a group for which the reliability would be greater than .80 for a test of 60 items. These are items that appear simple and concrete and provide a clear contrast of harmony and balance between designs.

Career Occupational Preference System (COPS; Educational and Industrial Testing Service, 1983). The Career Occupational Preference System is a group of interest tests used for career planning and published by Educational and Industrial Testing Service. The High School form of the COPS was administered to 350 examinees who were in high school when they were tested by the Foundation. Form P (Professional-Level) of the COPS was administered to the other 1,305 examinees,[1] who had already graduated from high school. Each form contains interest scales that span the realm of professional occupations, from science and technology to agriculture. The scale reliabilities tend to be high, averaging about .90. Of particular interest for this study were the Arts-Professional and

[1]COPS scores were not available for 31 examinees.

Arts-Skilled scales in the high school version and the Arts-Performing and Arts-Design scales in the professional version.

Artistic background questionnaire. The artistic background questionnaire assessed examinees' training and experience in the visual arts. The questions included both closed-ended portions to facilitate data analysis and open-ended portions that allowed examinees to elaborate on their experiences. Nikolaus Bezruczko designed a coding system for the open-ended responses that appears in Appendix A. The closed-ended responses and the coded values for the open-ended responses were then used in the analyses of the questionnaire. A copy of the questionnaire appears in Figure 5.

Procedures

Foundation clients take a total of five 90-minute sets of tests. Oral instructions precede all the tests. Two sets of tests are administered individually, and three are group-administered using taped and written instructions.

The artistic judgment tests were administered by means of written instructions at the end of sessions of tests from the standard battery. The tests were administered in this order: VDT, DJT, PA, VAST. In all cases, any tests started in one session were completed in that session. None of the tests was timed, and the standard directions for administration were used. The items were presented in booklets, and examinees marked their responses on separate answer sheets.

Analyses

The goal of the analyses in this report was to improve our understanding of the constructs measured by the four artistic judgment tests through an examination of their relationships with (a) the standard Foundation test battery; (b) the artistic background questionnaire; (c) the COPS interest tests, especially the artistic interest scales; and (d) college major and years of education; as well as (e) laterality. We describe these analyses in the remainder of this section. Note that because there were sex and age effects on the artistic judgment tests (Technical Report 1989-2), we partialled for sex and age when calculating all correlations. (In partialling for age, we used terms for both age and age-squared to correct for linear and curvilinear effects.) Also, because the reliabilities of the tests are less than 1.0, thus leading to correlation coefficients that underestimate the true association between scores, we corrected all correlations between tests for attenuation. The correlations between the experimental battery and items from the artistic background questionnaire, however, were not corrected because reliabilities could not be calculated for the questionnaire items.

Figure 5

Artistic Background Questionnaire

VOCATIONAL/AVOCATIONAL ACTIVITIES QUESTIONNAIRE

Name _____

Folder # Lab # _____

A number of the following questions concern the visual arts. The visual arts are endeavors involving primarily the visual form and beauty of objects or groups of objects. The visual arts include painting, sculpture, and photography and are related to such occupations as interior decoration, architecture, fashion design, graphic arts, and landscaping.

1. Please list your occupation: _____

   Describe your work: _____

2. Have you had any formal training in the visual arts? ___ yes ___ no

   If yes, how many years of training? _____

   Describe your training: _____

3. Do you or have you worked in a (visual) artistic or aesthetically-related occupation? ___ yes ___ no

   If yes, for how many years? _____

   Describe this work: _____

4. Do you engage in volunteer work or hobbies involving visual art (excluding everyday activities such as buying clothes)? ___ yes ___ no

   If yes, describe: _____

5. Have you ever won awards for your (visual) art? ___ yes ___ no

   If yes, describe: _____

Now please complete the questions on the other side of this page.

6. As far as you know, do you dream in color or black and white?

   ___ color ___ black and white ___ do not know

7. How often do you visit art museums or galleries featuring contemporary art? _____ times per year

8. How often do you visit art museums or galleries featuring classical art? _____ times per year

9. Check which of the following magazines that you read on a regular basis

   ___ Art in America ___ Art & Antiques
   ___ Art Forum ___ Connoisseur
   ___ Art News ___ Flash Art
   ___ Photography ___ Popular Photography
   ___ American Photography ___ Modern Photography
   ___ Architectural Digest ___ Vogue
   ___ Other magazines that emphasize visual art

   Please list: _____

10. Check the areas in which you have developed a pattern or design that was used in completing a project

    ___ Furniture ___ Ceramics ___ Interior decorating
    ___ Landscaping ___ Home remodeling ___ Floral arranging
    ___ Fashion

    If you checked any of these areas, please describe

11. Are there any other activities (excluding everyday tasks) involving visual art that you engage in that were not covered by this questionnaire?

    ___ yes ___ no

    If yes, describe: _____

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Unless otherwise stated, we used *SPSS/PC+* (Version 2.0; Norusis, 1988a) and *SPSS/PC+ Advanced Statistics* (Version 2.0; Norusis, 1988b) computer packages for these analyses.

Analysis of the Artistic Judgment Tests and the Foundation Standard Test Battery

In this analysis, we calculated the correlations between the artistic judgment tests and 24 tests in the standard Foundation battery. These tests measure many areas of mental performance including: reasoning, structural visualization, perceptual aptitudes, and others. This analysis was expected to establish the extent to which artistic judgment, as measured by the experimental battery, is associated with various aptitudes. The results might elucidate an underlying construct related to both cognitive performance and artistic judgment. All correlations for this analysis were partialled for sex and age and corrected for attenuation.

Predicting Artistic Judgment Test Scores on the Standard Foundation Worksamples

For this analysis, each of the artistic judgment tests was regressed on the tests in the standard battery to determine the extent to which the experimental tests measure constructs independent of those measured by the standard battery. The square of the multiple correlation (R^2) represents the proportion of overlapping variance between each artistic judgment test and the standard battery. Low values of R^2, especially under .10, indicate that an experimental test measures a construct that is independent of the standard battery. Because the relationships between the artistic judgment tests and the standard battery were relatively weak, we did not perform a joint factor analysis.

Analysis of the Artistic Judgment Tests and the Artistic Background Questionnaire

This analysis examines the association of the artistic judgment tests with the items from the artistic background questionnaire. It is presumed that persons with greater amounts of artistic aptitude are more likely to acquire experience and training in the visual arts, so that the questionnaire items can be expected to correlate positively with the experimental tests.

For this analysis, we used the closed-ended responses and the coded open-ended responses (based on a systematic coding plan that was described earlier in the Method section) on the artistic background questionnaire to define graded and nominal variables. For the graded variables, we calculated correlations between the questionnaire variables and the artistic judgment tests. Again, these

correlations were partialled for sex and age. For some of the graded items we also performed one-way analyses of variance (ANOVAs).

For the nominal variables, we used the questionnaire items as independent variables in one-way ANOVAs with each of the artistic judgment tests, controlling for sex and age.

Analysis of the Artistic Judgment Tests and the COPS Interest Tests

We calculated correlations between the artistic judgment test scores and the scales on the college and high school forms of the COPS interest tests.

Analysis of the Artistic Judgment Tests and College Major and Level of Education

To examine the relationships between college major and the artistic judgment tests, we grouped examinees into three categories. The first and largest category consisted of examinees who had not declared art as their major during their junior or senior year in college. A second category consisted of examinees who had declared a major associated with commercial art such as graphic design, illustration, advertising, or commercial photography. We called this group Business Art majors. Finally, we formed a third category that consisted of examinees who had declared Fine Art as their college major. We examined the differences between these groups, for each of the artistic judgment tests, with a univariate analysis of variance.

In order to investigate the association between years of education and the artistic judgment tests, we grouped examinees into four levels of education: (a) examinees who completed only high school (or less than high school), (b) examinees who attended but did not graduate from college, (c) examinees who graduated from college, and (d) examinees who attended graduate or professional school. These groups were also analyzed with univariate analyses of variance.

Unfortunately, among our examinees educational level tends to be confounded with age. For example, most examinees with 18 years or more of education are in at least their mid-20s. To control for this confound, we repeated the analysis using only examinees above the age of 30.

Analysis of the Artistic Judgment Tests and Laterality Measures

We assessed the relationships between the artistic judgment tests and two laterality measures, an eye dominance test and a hand dominance test, with

univariate analyses of variance. For these analyses, the dependent variables were the artistic judgment tests.

RESULTS

The Artistic Judgment Tests and Their Relationships With the Standard Foundation Battery

Table 2 displays the correlations between the artistic judgment tests and the tests in the standard Foundation battery. (The correlations not corrected for attenuation are presented in Appendix B.) Although the correlations are low, all the artistic judgment tests show some degree of association with the standard battery. In addition, the artistic judgment tests show a pattern of association with the other tests that has implications for understanding their underlying constructs. In the following sections we present the relationships of the individual tests in the artistic judgment battery with the tests in the Foundation battery and describe the overall pattern of association between the experimental battery and the Foundation battery.

To illustrate the effect of correlations of this magnitude, we show the two-way frequency distribution for the DJT and Reading Efficiency (RE; uncorrected correlation = .15) in Table 3. As can be seen in the table, as scores on the DJT go up, scores on RE tend to go up. For the lowest group on the DJT, 24.3% of the examinees scored in the lowest group on RE and 8.6% in the highest group. In contrast, for the highest group on the DJT, the corresponding percents are 13.5 and 18.3. Nevertheless, as the table indicates, with correlations of this magnitude, many examinees do not follow the trend, scoring above average on one test and below average on the other.

Design Judgment Test

The DJT showed a relatively wide range of significant positive correlations with the worksamples in the standard battery. Although the associations were modest, they suggest an underlying relationship between the preference for asymmetrical designs, when contrasted with symmetrical designs, and cognitive abilities.

Specifically, the DJT showed significant positive correlations with Ideaphoria (*r* = .10), Analytical Reasoning (.18), and two tests of structural visualization (Wiggly Block, .16, and Paper Folding, .22). It also showed significant positive correlations with Memory For Design (.13) and Silograms (.10), as well as Pitch Discrimination (.11) and Personality (-.11). The highest correlation of the DJT was with English Vocabulary (.23).

Table 2

Correlations Between the Artistic Judgment Tests and the Standard Foundation Battery[a]

Worksample	DJT	VDT-SIM	VDT-UNI	PA-C	PA-.67	VAST	Relia.
Number Checking			08			12	96
Color Perception							NA
Ideaphoria	10	11				12	97
Foresight							97
Inductive Reasoning		09	07			13	84
Analytical Reasoning	18	16				27	65
Number Series						31	87
Wiggly Block	16	13				20	73
Paper Folding	22	17		-10		20	82
Personality	-11	-13		08			89
Tonal Memory					08	22	92
Pitch Discrimination	11	09	08		10	19	80
Rhythm Memory			15			22	73
Memory for Design	13	16	15		07	19	80
Silograms	10	13				10	92
Number Memory							82
Observation							62
Finger Dexterity							86
Tweezer Dexterity							93
English Vocabulary	23	24					96
Math. Vocabulary							NA
Reading Efficiency							73
Writing Speed							NA
Reliability	89	95	88	76	78	66	

Note. Leading decimals omitted. All correlations corrected for attenuation. Table displays only correlations significant at the .01 level. *N*s range from 1,380 to 1,548, except for Mathematics Vocabulary, for which *N* = 890. All correlations partialled for sex and age. The correlations not corrected for attenuation are presented in Appendix B.

[a]Notation for artistic judgment tests: DJT (Design Judgment Test), VDT-SIM (Visual Designs Test-Simplicity), VDT-UNI (Visual Designs Test-Uniformity), PA-C (Proportion Appraisal: Consensus scoring), PA-.67 (Proportion Appraisal: .67 scoring), VAST (Visual Aesthetic Sensitivity Test).

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Table 3

Two-Way Frequency Table of Reading Efficiency by Design Judgment Scores

		Design Judgment					
		0-4	5-7	8-11	12-14	15-17	18-22
Reading Efficiency	31-40	.086	.099	.146	.188	.186	.183
	28-30	.150	.130	.167	.196	.159	.197
	25-27	.176	.202	.183	.145	.195	.197
	22-24	.221	.161	.204	.176	.205	.148
	19-21	.124	.193	.161	.129	.127	.140
	0-18	.243	.215	.139	.165	.127	.135

Note. The values in the table represent percentages of examinees scoring in each range on the DJT who scored in each range on RE. For example, in the first column the value *.221* indicates that .221 of the examinees scoring in the 0-4 range on the DJT scored in the 22-24 range on RE. The correlation between the DJT and RE is .15 ($p < .001$), not corrected for sex, age, or attenuation.

These results show that the DJT, which has shown empirical relationships with external art criteria, is not entirely independent of cognitive abilities. Although the degree of association is weak, the empirical analysis shows consistent evidence for a low positive association with reasoning, spatial ability, and several perceptual aptitudes. The negative correlation with Personality indicates that examinees with high scores on the DJT tend to have subjective outlooks, relying more on personal reactions for their judgments than external standards. While these correlations must be interpreted cautiously, the results show a subtle relationship between DJT scores, cognitive ability, and personality that may have practical implications.

Visual Designs Test: Simplicity

The VDT Simplicity scale showed a pattern of associations with the standard battery that was remarkably similar to the pattern of the DJT. While the underlying constructs for the tests clearly differ--that is, the DJT tests the preference for (greater) asymmetry and Simplicity tests the preference for lesser complexity--Simplicity, like the DJT, correlated significantly with Ideaphoria (.11) and Analytical Reasoning (.16), but also with Inductive Reasoning (.09). Simplicity also correlated positively with Wiggly Block (.13) and Paper Folding (.17), as well as Memory for Design (.16), Silograms (.13), Pitch Discrimination (.09), and Personality (-.13). As with the DJT, the highest correlation for Simplicity was with English Vocabulary (.24).

These results show that persons who prefer less-complex designs, when presented with random patterns that differ in complexity, tend to score higher on tests of reasoning, spatial ability, and several perceptual aptitudes as well as subjective personality. The similarity of this pattern to the results of the DJT analysis suggests that, despite their fundamental differences, these tests share a common association with cognitive ability, as well as an aspect of personality. The extent to which this test is related to external criteria of artistic judgment, however, has not been established at this point.

Visual Designs Test: Uniformity

VDT Uniformity showed a fairly weak pattern of association with the standard battery, correlating significantly with Number Checking (.08), Pitch Discrimination (.08), Rhythm Memory (.15), and Memory for Design (.15).

Proportion Appraisal: Consensus

The association of PA with the standard battery was the weakest among the tests in the artistic judgment experimental battery. PA-Consensus correlated negatively with Paper Folding (-.10.), indicating that persons who prefer shapes that do not agree with the group consensus tend to score higher on tests of structural visualization. PA-Consensus's positive correlation with Personality

indicates that persons who agree with the preferences established by the group consensus tend, not surprisingly, to give responses on Personality that show agreement with a common outlook or perspective.

Proportion Appraisal: .67

As with PA-Consensus, PA-.67 shows very little relationship with the standard battery. It correlated positively with Tonal Memory (.08), Pitch Discrimination (.10), and Memory for Design (.07).

Visual Aesthetic Sensitivity Test

The VAST associated with a broad range of worksamples in the standard battery. It correlated significantly with Number Checking and Ideaphoria, *r*s = .12 and .12, respectively, as well as with Inductive Reasoning (.13) and Analytical Reasoning (.27). It showed the highest single correlation of any of the tests in the artistic judgment battery, correlating .31 with Number Series. The VAST also correlated positively with both tests of structural visualization (Wiggly Block, .20; Paper Folding, .20) and with Tonal Memory (.22), Rhythm Memory (.22), Memory for Design (.19), and Silograms (.10).

These results show that the ability to identify balance and harmony in visual designs has significant associations with a wide range of mental abilities.

The tendency for VAST test scores to correlate not only with cognitive abilities but with measures of auditory performance such as Pitch Discrimination, Tonal Memory, and Rhythm Memory suggests that the theory underlying the VAST--a Taste factor extending across a broad range of perceptual modalities--may be empirically supported, albeit to a fairly limited extent.

Several of the correlations between the VAST and the aptitude battery are consistent with the associations reported for the DJT and VDT Simplicity, although the pattern of association for the VAST appears to have important differences. In general, the VAST correlates slightly stronger with the aptitude battery, and its association is with more worksamples, suggesting a broader underlying association with cognitive abilities than for the DJT or Simplicity. The VAST also appears to have a stronger association with reasoning, both verbal and quantitative, although not with English vocabulary.

Summary of Associations of the Experimental Tests With the Standard Battery

Overall, the correlations between the artistic judgment tests and the worksamples from the standard battery show several patterns that should be noted. First is the association between several of these tests and the worksamples testing reasoning, spatial ability, and perceptual aptitudes such as pitch

discrimination and visual memory. The DJT and Simplicity showed this pattern in their associations, and the relationships are common to the VAST, and to a lesser extent, to Uniformity, as well as PA-Consensus and PA-.67.

Second is a significant pattern of association for the DJT and Simplicity with English Vocabulary. It is not clear whether vocabulary knowledge facilitates performance on the DJT and Simplicity or underlying factors contribute to performance on both vocabulary and artistic judgment tests. Dewar (1938) noted an association between intelligence and artistic judgment test scores and suggested that aesthetic perception may consist of "implicitly apprehending a pattern of cognitive relations between the sensory stimuli: and intelligence . . . as the power of educing, consciously or unconsciously, such cognitive relations" (1938, p. 46), suggesting that artistic judgment may be part of a fundamental process of cognition, a view supported by Arnheim (1957). While this perspective is speculative, and the correlation is modest, the association between English vocabulary and artistic judgment suggests that researchers should examine the issue further.

Third is an association between Personality and the DJT, Simplicity, and PA-Consensus. The results in this study suggest that persons whose scores correlate with external art-related criteria tend, slightly, to base their preferences on idiosyncratic reactions to designs rather than characteristics of designs that have broad appeal. This result suggests that the influence of systematic underlying properties, such as rules or principles, affects their preferences less than the personalized reactions they experience. While the correlations are fairly low, this result is particularly interesting because the interpretive content for the items in these tests, visual characteristics that may elicit affective reactions, by explicit design, is highly controlled and not intended to interact with personality differences among the examinees. Because we found this association to be consistent across three tests, this is an area of investigation that future research may find fruitful.

Finally, none of the artistic judgment tests correlated with the measures of dexterity. Because researchers hypothesize that artistic judgment is a perceptual sensitivity, not dependent on the ability to produce art objects, the lack of an association with dexterity is not surprising. Inasmuch as dexterity contributes to the production of visual art, its contribution appears to be independent of the tests in the experimental battery.

Predicting Artistic Judgment Test Scores From Scores on the Standard Foundation Worksamples

This analysis addressed the amount of overlap between the artistic judgment tests and the standard Foundation aptitude battery. While the correlations between the artistic judgment tests and the aptitude battery are low, this regression of artistic judgment tests on the aptitude battery establishes the precise amount of unique variance attributable to each test of artistic judgment. Table 4

shows the extent to which the artistic judgment tests measure constructs that are independent of the worksamples in the Foundation battery.

Table 4

Regression Analyses Predicting Artistic Judgment Scores From Worksamples in the Standard Foundation Battery[a]

Artistic judgment tests	Alpha relia.	Multiple *R*	*R*-squared[b]	Percentage of unique, reliable variance
Design Judgment Test	.89	.32	.10 (.09)	.80
VDT Simplicity	.95	.33	.11 (.10)	.85
VDT Uniformity	.88	.15	.02 (.01)	.87
PA-Consensus	.76	.20	.04 (.03)	.73
PA-.67	.78	.19	.04 (.02)	.76
Visual Aesthetic Sensitivity Test	.66	.32	.10 (.09)	.57

Note. Minimum pairwise *N*s ranged from 779 to 872 across artistic judgment tests. All *R*s significant at $p = .001$.

[a]Tests were regressed on Number Checking, Ideaphoria, Foresight, Inductive Reasoning, Analytical Reasoning, Number Series, Wiggly Block, Paper Folding, Personality, Tonal Memory, Pitch Discrimination, Rhythm Memory, Memory For Design, Silograms, Number Memory, Observation, Finger Dexterity, Tweezer Dexterity, Mathematics Vocabulary, and Reading Efficiency.

[b]Number in parenthesis is R^2 adjusted for shrinkage (Cohen & Cohen, 1975).

[c]Alpha reliability minus R^2 = unique and reliable variance.

As indicated by the values for *R*-squared, the majority of the score variance for the artistic judgment tests is independent of the Foundation battery. Among the experimental scales, VDT Simplicity showed the greatest amount of overlap with the aptitude battery (R^2 adjusted for shrinkage = .10), and that overlap is relatively minimal (compare with Table 20, p. 66, in Technical Report 1988-4). In

spite of the overlap, VDT Simplicity showed the greatest proportion of unique, reliable variance because it has the highest reliability of the experimental scales.

The Artistic Judgment Tests and the Artistic Background Questionnaire

The results of an analysis of the relationships between the items on the artistic background questionnaire and the experimental battery are described below for the individual artistic judgment tests and displayed in Tables 5 and 6.

Correlations Between Artistic Judgment Tests and Individual Items

Design Judgment Test

Scores on the DJT showed the strongest associations with the items on the artistic background questionnaire. The DJT correlated significantly with years of art training (.18), highest level of training attained (.18), level of organization granting award (.12), highest award received (.09), frequency of contemporary (.22) and classical (.17) museum attendance, and number of art-related hobbies and other art activities (.12).

This pattern of associations shows that persons who prefer asymmetrical designs when contrasted with symmetrical designs tend to take art classes and go to art school, consistent with an underlying construct for the test that is art-related. In addition, the pattern of correlations between the DJT and individual items also shows that DJT scores are related to the receiving of prizes, the production of art works, museum attendance, and other art activities not directly related to enrollment in formal training, thus supporting the test's construct as an aptitude.

These results suggest that the DJT should be investigated further for its validity as a measure of artistic judgment.

Visual Designs Test: Simplicity

VDT Simplicity showed a pattern of positive correlations with the questionnaire items that was similar to the DJT, although slightly weaker. Simplicity correlated with years of art training (.14), level of training (.12), classical (.13) and contemporary (.14) museum attendance, and number of art-related hobbies and other art activities (.12).

Thus persons who prefer the less-complex designs when presented with random patterns that differ in complexity tend to take art classes, attend art school, visit art museums, and engage in art hobbies and other art-related activities.

Table 5

Correlations Between the Artistic Judgment Tests and the Artistic Background Questionnaire[a]

Questionnaire items	DJT	VDT-SIM	VDT-UNI	PA-C	PA-.67	VAST
1 Degree of emphasis of art in occupation						
2a Years of art training	18	14		-07		
2c Highest level of art training[b]	18	12		-06		
3a Years artistically employed						
4 Art volunteer						
5a Level of organization granting art award[c]	12			-07		
5b Highest art award received	09			-07		
5c Frequency of art award						
7 Number of classical museum visits	17	13		-08		
8a Number of contemporary museum visits	22	14		-11		-10
9 Number of art magazines read						
10 Number of designs developed						
11 Number of art hobbies and other art activities	12	12				

Note. Minimum pairwise N = 1,001. Leading decimals omitted. Table displays only correlations significant at .01. All correlations controlled for sex and age but not attenuation.

[a]Notation for artistic judgment tests: DJT (Design Judgment Test), VDT-SIM (Visual Designs Test Simplicity), VDT-UNI (Visual Designs Test Uniformity), PA-C (Proportion Appraisal: Consensus scoring), PA-.67 (Proportion Appraisal: .67 scoring), VAST (Visual Aesthetic Sensitivity Test).

[b]The categories here were high school, community college, four-year college, and art school.

[c]The categories here were high school, college, art school, and museum.

Table 6

Analysis of Variance of Artistic Judgment Tests by Specialization of Art Training

Artistic judgment tests	Training emphasis			*SD*	*F*	*p*
	Non-art	History	Design & production			
Design Judgment Test	10.0	12.20	12.89	5.86	36.86	<.01
VDT Simplicity	11.10	13.38	14.56	9.65	17.47	<.01
PA-Consensus	39.34	38.22	37.65	8.99	5.33	<.01
Ns	1025-1132	89-103	104-334			

Note. The differences were not significant at the .05 level for the VDT Uniformity scale, PA-.67, and the VAST.

Visual Designs Test: Uniformity

VDT Uniformity did not show any positive correlations with the questionnaire items.

Proportion Appraisal: Consensus

Previous research indicated that artists are characterized by low scores on PA. Hence we expected both PA-Consensus and PA-.67 to correlate negatively with the questionnaire items. In line with this expectation, PA-Consensus scores showed several significant negative correlations with the questionnaire items, indicating that the preference for shapes that differ from the group consensus is indeed associated with a background in art-related activities. Scores on PA-Consensus showed significant associations with years of art training (-.07), level of art training (-.06), and organization granting art award (-.07). Low scores on PA-Consensus also showed a significant association with classical and contemporary museum attendance (-.08, and -.11, respectively).

Proportion Appraisal: .67

PA-.67 did not show any significant correlations with the questionnaire items.

Visual Aesthetic Sensitivity Test

The VAST showed a negative correlation with contemporary museum visits (-.10), suggesting that persons who prefer balanced and harmonious designs tend not to go to that type of museum. In comparison, the correlation with classical museum visits was not statistically significant.

Analysis of Variance of Artistic Judgment Tests and Questionnaire Items

An ANOVA first examined the associations between examinees' specialization of art training and artistic judgment test scores. A second ANOVA then analyzed the association between the dimensionality reported by examinees who were employed in art occupations and the artistic judgment test scores. Table 6 shows that examinees who acquired training in the design and/or production of art objects tended to score higher on the DJT and Simplicity and lower on PA-Consensus than examinees trained only in history or appreciation and examinees who had not had any training. There were no significant differences for specialization of training on Uniformity, PA-.67, and the VAST.

When we analyzed the dimensionality of art occupation, which is indicated by an examinee's art occupation--working with two-dimensional stimuli, three-dimensional stimuli, or stimuli consisting of multi-dimensional spaces such as theater sets--DJT scores differed significantly $F(3;1,268) = 5.24$, $p < .001$. Artists working in two-dimensional space scored significantly higher than those working in three-dimensional or multidimensional spaces (means = 13.9, 11.3, 11.4, respectively; $SD = 5.9$). Simplicity scores for persons working in two-dimensional spaces were also the highest among the three groups, although the difference was slightly less than our criterion for chance.

Summary of the Association Between the Experimental Battery and the Artistic Background Questionnaire

The DJT, Simplicity, and PA-Consensus (when scores are reversed) showed similar patterns of association with art training, art awards, and art hobbies, suggesting that these tests, while they ostensibly measure different variables, do appear to a share some aspect of an underlying construct related to art criteria. The magnitudes of the correlations, thus the strength of the commonality, while modest, are statistically significant, indicating that the relationship is reliable. The practical importance of these associations, however, will need to be demonstrated.

The Artistic Judgment Tests and the COPS Interest Tests

The correlations between the artistic judgment tests and the scales from the college and high school forms of the COPS interest test appear in Tables 7 and 8, respectively. On the high school form, two scales of particular interest are the Arts-Skilled and Arts-Professional scales. On the college form, the Arts-Performing and Arts-Design scales are of particular interest.

Design Judgment Test

The results show that the DJT correlated positively with both scales on the high school form that indicate interest in art (.26, .19), providing additional evidence that DJT scores are related to art criteria. The DJT, in relation to the high school form, also correlated negatively with interest in Clerical occupations (-.12) and positively with interest in Communication (.26).

On the college form, the DJT again showed positive correlations with interest in art, correlating .12 with Arts-Performing and .25 with Arts-Design. In addition, the DJT showed positive correlations with interest in Technology-Mechanical and Technology-Civil (.10, .10), Outdoor-Nature (.10), and Communication-Written (.13) and a negative correlation with interest in Business-Finance (-.10).

Visual Designs Test: Simplicity

On the high school form, VDT Simplicity showed significant associations with interest in the arts, correlating .15 and .13 with Arts-Professional and Arts-Skilled, respectively. It also correlated positively with Technology-Professional (.05) and Communication (.12) and negatively with interest in Clerical occupations (-.14).

On the college form, Simplicity did not correlate with interest in art although it correlated positively with Communication-Written (.07). It correlated negatively with interest in business (-.11, -.09), Communication-Oral (-.08), and service occupations (-.08,-.07).

Visual Designs Test: Uniformity

VDT Uniformity correlated positively with interest in Technology-Professional on the high school form and negatively with Service-Social on the college form.

Proportion Appraisal: Consensus

PA-Consensus did not correlate significantly with interest in art on the high school form, but it correlated negatively with interest in Technology-Professional (-.16) and Communication (-.15) and positively with Clerical (.16) and Service-Skilled. These associations suggest that persons who do not agree with the group

Table 7

Correlations Between the Artistic Judgment Tests and the COPS Interest Scales (High School Form)

COPS scales[a]	DJT	VDT-SIM	VDT-UNI	PA-C	PA-.67	VAST
Science-Professional						
Science-Skilled						
Technology-Professional		05	11	-16		
Technology-Skilled						
Clerical	-12	-14		16		
Consumer-Electronics						
Arts-Professional	26	15				
Arts-Skilled	19	13				
Outdoor						
Service-Skilled				13		
Service-Professional						
Business-Skilled						
Business-Professional						
Communication	26	12		-15		
Reliability	89	95	88	76	78	66

Note. Leading decimals omitted. All correlations controlled for sex and age and corrected for attenuation. Pairwise *N*s range from 293 to 350. Table presents only correlations significant at .01.

[a]Notation for artistic judgment tests: DJT (Design Judgment Test), VDT-SIM (Visual Designs Test Simplicity), VDT-UNI (Visual Designs Test Uniformity), PA-C (Proportion Appraisal: Consensus scoring), PA-.67 (Proportion Appraisal: .67 scoring), VAST (Visual Aesthetic Sensitivity Test).

Table 8

Correlations Between the Artistic Judgment Tests and the COPS Interest Scales (College Form)

COPS scales[a]	DJT	VDT-SIM	VDT-UNI	PA-C	PA-.67	VAST
Science-Medical-Life						09
Science-Physical						
Technology-Electrical						
Technology-Mechanical	10					
Technology-Civil	10					
Outdoor-Nature	10				-09	
Outdoor-Agribusiness						
Business-Finance	-10	-11				
Business-Management		-09				
Computation						
Communication-Written	13	07		-08	-07	
Communication-Oral		-08				
Arts-Performing	12			-07		
Arts-Design	25					
Service-Instructional		-08				
Service-Social		-07	-08			
Reliability	89	95	88	76	78	66

Note. Leading decimals omitted. All correlations controlled for sex and age and corrected for attenuation. Pairwise *N*s range from 1,174 to 1,686. Table displays only correlations significant at .01.

[a]Notation for artistic judgment tests: DJT (Design Judgment Test), VDT-SIM (Visual Designs Test Simplicity), VDT-UNI (Visual Designs Test Uniformity), PA-C (Proportion Appraisal: Consensus scoring), PA-.67 (Proportion Appraisal: .67 scoring), VAST (Visual Aesthetic Sensitivity Test).

consensus tend, slightly, to show interest in professional occupations related to technology, while persons who tend to agree with the general consensus show interest in clerical and service-related occupations requiring specialized skills.

On the college form, PA-Consensus correlated negatively with interest in Arts-Performing (-.07) and with occupations requiring written communication skills (-.08). Thus, low PA-Consensus scores, indicating preferences that differ from the group consensus, tend to correlate to a modest extent with an interest in art occupations.

Proportion Appraisal-.67 and Visual Aesthetic Sensitivity Test

PA-.67 and the VAST showed no significant correlations with the art scales and little correlation with the other interest scales.

Summary of the Associations Between the Experimental Battery and the COPS Scales

All of the correlations between the artistic judgment tests and the interest scales were moderately low or lower. Several patterns of correlations between the artistic judgment battery and the COPS should be noted, however. First, on the high school form, the significant negative associations for high scores on the DJT and Simplicity--the expected pattern of responses for artists--and on PA-Consensus with the Clerical interest scale suggests that art ability may be inversely related to interest in clerical tasks. A similar pattern but in the opposite direction occurs with Communication interest. For that scale, the DJT and Simplicity show positive correlations, while PA-Consensus shows a negative correlation.

On the college form, the DJT and Simplicity show significant negative correlations with interest in Business-Finance, indicating that the preference for asymmetric and less-complex designs has an inverse relationship with interest in business. Also of note is the positive association of the DJT and Simplicity with interest in Communication, which is consistent with the relationship found on the high school form.

These results show that, while the relationship between the artistic judgment tests and occupational interests is relatively weak, scores on the DJT, Simplicity, and PA-Consensus show a trace of consistency that may be related to an underlying construct. Scores on these tests tend to correlate with an interest in occupations related to art, as well as interest in occupations requiring communication and possibly technology. Scores on these tests also tend to be similar in their negative relationship with interest in business.

The Artistic Judgment Tests, College Major, and Level of Education

Another source of external validation for these artistic judgment tests, in addition to their correlations with questionnaire items and interest in occupations, is their associations with biographical data such as choice of college major and level of education attained. Of particular interest is whether examinees who chose art-related majors during their college enrollment obtained higher artistic judgment test scores than non-art majors and whether test scores increase with years of education.

The Artistic Judgment Tests and College Major

To address the first of these questions, the association between college major and test scores, univariate analyses of variance examined scores on each of the tests with examinees grouped into art, business art, and non-art majors (see the Method section for details). Table 9 shows the results.

In general, fine art and business art majors scored in opposite directions. The fine art majors scored highest of the three groups on the DJT and Simplicity, while the business art majors scored lowest. On PA-Consensus, the business art majors scored highest, while the fine art majors scored lowest. On the VAST, the non-art majors scored highest, followed by the business art and then the fine art majors.

These results indicate that the artistic specialization of examinees has a significant association with their visual preferences. Not surprisingly, commercial ("business") artists, whose work must appeal to the general public, have lower scores on the DJT and Simplicity, indicating greater preference for symmetrical and complex designs than fine artists. These results suggest that the independence of judgment that researchers have identified as characteristic of artists (see Barron, 1953; Barron & Welsh, 1952; Child, 1965), may be more accurately attributed to fine artists. These results indicate that the preferences of commercial artists are more consistent with the general consensus, and thus less likely to appear idiosyncratic.

The Artistic Judgment Tests and Education Level

After the examinees were grouped according to level of education, univariate analyses of variance indicated that scores on all the artistic judgment scales were higher for persons with at least some college education than for persons with less education. Compared to examinees with only high school or less education, examinees with at least some college education showed:

1. greater preference for asymmetrical designs,
2. greater preference for lesser complexity when shown random patterns (VDT),

3. greater preference for uniformity when shown random patterns,
4. greater preference for proportions that are consistent with the group consensus,
5. greater preference for shapes with the ratio of .67, and
6. greater capacity to identify designs with balance and harmony.

Table 9

Analysis of Variance of Artistic Judgment Tests by College Major

Artistic judgment tests	College major			*SD*	*F*	*p*
	Fine art	Business art	Non-art			
Design Judgment Test	14.58	11.04	11.20	5.86	4.31	.01
VDT Simplicity	16.80	11.56	13.29	9.67	5.70	.01
VDT Uniformity	8.13	8.32	7.78	3.95	.47	.63
PA-Consensus	40.28	46.51	42.65	8.48	4.77	.01
PA-.67	37.03	40.22	37.83	8.48	.89	.41
VAST	38.03	40.07	41.25	3.92	10.97	<.01
N	36-40	41-46	498-646			

Note. For each analysis, sex, age, and age-squared were used as covariates. The means in the table are adjusted means.

With further education after four years of college, scores continue to increase for the DJT, PA-Consensus, and PA-.67. These results indicate that, at the highest levels of education, examinees showed greater (a) preference for asymmetrical designs, (b) conformity to group consensus, and (c) preference for

shapes in a ratio of .67. Preferences for less-complex designs and designs with more uniformity and the capacity to select balanced and harmonious designs did not increase.

Next, we controlled for age by performing the ANOVAs only on examinees older than 30 years of age. In these analyses, only the DJT and the VAST showed differences for level of education. Table 10 shows the means for the four education groups. DJT scores continue to increase with education, while the VAST shows the highest scores for examinees who started but did not graduate from college.

Table 10

Analysis of Variance of Artistic Judgment Tests by Education Level

Artistic judgment tests	Years of education				*F*	*p*
	0-12	13-15	16	17-22		
Design Judgment Test	9.87	10.35	11.57	12.72	6.30	<.001
Visual Aesthetic Sensitivity Test	38.00	40.80	40.51	40.63	3.10	.027
Ns	28-30	83-88	155-178	156-175		

Note. Only examinees over age 30 included.

Artistic Judgment and Laterality

Univariate analyses of variance of the artistic judgment scores by eyedness, handedness, and sex showed significant main effects for eyedness on VDT Uniformity: $F(2;1427) = 5.78$, $p < .05$. The eyedness group with the highest scores on Uniformity was the "mixed" dominance group, who used their

nondominant eye on at least one trial of the eyedness test.[2] The VAST showed eye by hand and eye by sex interactions: $F(4;1353) = 2.60$, $p < .05$, and $F(2;1353) = 3.15$, $p < .05$, respectively. Examinees with crossed hand-eye dominance tended to score higher than matched-dominant examinees, and right-eyed females scored higher than males on the VAST. There were no significant effects on the DJT, VDT Simplicity, and PA.

DISCUSSION

The purpose of the analyses in this study was to examine the associations of three tests of visual preference and one test of objective judgment (the VAST), each purportedly testing an aspect of artistic judgment, with art- and non-art-related criteria external to the respective tests. Through analyses of associations between the artistic judgment tests and the aptitude tests in the Foundation battery, items from an artistic background questionnaire, and scales from an occupational interest survey, as well as biographical data regarding college major and years of education, we expected to obtain evidence concerning several issues. These issues included: (a) the independence of test scores from the standard Foundation aptitude battery, (b) evidence that the responses to the items on these tests are based on an aptitude, and (c) evidence for a general variable, or some higher-order structure, that underlies the responses to the items on these tests.

The correlations with the questionnaire items are somewhat supportive of associations between the DJT, VDT Simplicity, and PA-Consensus and external art criteria. Similarly, the results from the COPS interest scales suggest that the DJT, Simplicity, and PA-Consensus also have associations with interest in art. Some of the most interesting and particularly supportive results come from the analysis of college major. This analysis showed not only that art majors differ systematically from nonartists, but also that significant differences in preference exist among art majors. Fine art majors showed significantly higher scores than nonartists and business art majors on the DJT and Simplicity, and they showed the lowest scores on PA-Consensus. On the DJT and Simplicity, however, business art majors scored in the opposite direction, showing greater preference for symmetrical and more-complex patterns than fine art majors and even nonartists.

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[2]On two trials of the Eyedness test (according to the standard procedures when these data were collected), examinees were directed to use their nondominant eye. Therefore, the "mixed" dominance group includes examinees who changed eyes as directed on these trials in addition to examinees who changed eyes spontaneously on other trials. As a consequence, this effect for Uniformity could mean that examinees who can switch eyes on command prefer more-uniform designs over more-disordered designs.

Regarding laterality, many of the hypotheses that we offered earlier in this report were not supported. The DJT, VDT Simplicity, and PA did not show any effects for hand and eye dominance, and the VAST did not show any main effects. The effect for eyedness on VDT Uniformity was interesting. The highest scores on Uniformity were for persons who changed eyes on at least one trial of the eyedness test, either spontaneously or when directed to do so. This finding is especially intriguing in that the nonkeyed designs on the scale tend to be less symmetric and balanced in terms of the left and right sides than the keyed designs. It appears that persons whose eye dominance is poorly established or persons who can change eyes on command (or both) prefer designs that are laterally balanced.

The results for the VAST may be related to the Uniformity finding. Examinees who were crossed-dominant or reverse-crossed-dominant on the Hand & Eye test were the highest-scoring laterality group on the VAST--that is, they were the most likely to identify the designs keyed as balanced and harmonious. Thus, again, examinees who may be less strongly lateralized appear to prefer balanced visual designs.

The overall results of the study, however, while encouraging in that they suggest that artistic judgment scores are associated with an art construct, are based on relationships that, although broad in their scope, are relatively weak in their magnitude. None of the correlations between the artistic judgment tests and the external criteria exceeded .31. While some of the differences between college-major groups approached one standard deviation in size, the practical implications of the differences are unclear. Relatively few of the examinees were currently employed in art-related occupations at the time of this study, and when we examined the differences between persons actually employed in art and non-art occupations, they were not significant. Consequently, the results obtained in this study need to be compared with the results for a group of professional artists, preferably both fine and commercial artists.

The discussion thus far has addressed the primary issue in this study, namely, the relationships between these tests and art criteria. The conclusion that several of these tests are related to art criteria, assuming that these results are replicated with professional artists, is broadly supported. The evidence concerning a second question, whether these tests measure an aptitude or an acquired skill is less definitive. On the one hand, the tests do not show a strong association with education. After age is controlled, only the DJT shows a significant monotonic association with years of education, and we speculate that the higher DJT ability of highly educated persons predates their advanced education. Similarly, VAST scores were higher for those who had attended college than for those who had not, and this difference is likely to have existed before the examinees attended college. Because we had no examinees under the age of 14, we were not able to investigate test performance at earlier ages, when ability may be more easily affected by differences in experience.

In order to clarify the relationships between these tests and experience, and thus establish their status as aptitudes, a study should be conducted in which these tests are administered to students who are in various stages of the educational process. If the tests do not show associations with school achievement, that would constitute evidence that the tests measure an art aptitude.

SUMMARY AND CONCLUSIONS

1. A regression of the tests in the experimental battery on the tests in the standard Foundation battery showed that the experimental battery is largely independent of the aptitudes tested by the standard battery. The *R*-squared values ranged from .02 to .11.

2. The tests in the experimental battery showed several modest correlations with aptitudes measured by the standard Foundation battery. The highest correlation was between the VAST and Number Series (r = .31). Lower but significant correlations were observed between experimental tests and tests of reasoning, structural visualization, and visual memory.

3. The analysis of responses to the artistic background questionnaire indicated that the DJT, VDT Simplicity, and PA-Consensus were significantly associated with years of art training, highest level of art training attained, art museum attendance, and number of art hobbies. The highest correlation was between the DJT and number of contemporary museum visits (r = .22).

4. The DJT, VDT Simplicity, and PA-Consensus showed significant relationships with interest in artistic occupations on the COPS interest scales. The DJT showed the strongest associations with interest across the several artistic scales.

5. An analysis of artistic judgment scores for examinees who majored in art in college and those who did not showed significant differences on all scales except PA-.67. The differences between fine art and business art majors were as large as .82 of a standard deviation, for the VAST.

6. An examination of education level indicates that the experimental battery is largely independent of years of education, when scores are controlled for age. Only the DJT and the VAST showed significant relationships with education.

7. VDT Uniformity showed a significant effect for Eyedness, and the VAST showed an eye by hand interaction. It is possible that less-lateralized persons tend to prefer more-laterally-balanced designs.

In conclusion, these analyses indicate that three tests in the experimental battery--the Design Judgment Test, the Visual Designs Test, and Proportion Appraisal--show significant relationships with art criteria. The relationships are modest, however. The tests need to be studied further with professional artists and school children.

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Appendix A: *Coding System for the Artistic Background Questionnaire*

Item no.	Description	Code
1.	The emphasis on art in occupation.	0 = no art (or little art) 1 = art is not a primary emphasis 2 = art is a primary emphasis
2a.	Number of years of art training.	0 = no art training 1 = 1 or more introductory art courses without any specialization 2 = 1 year of art courses with an explicit specialization 3 = more than 1 year of training but less than 5 with 1 or more specialties 4 = 5 or more years of training
2b.	Art training specialization.	0 = no art training 2 = history or appreciation 3 = design and/or production of art objects
2c.	Highest level of art training.	0 = no art training 1 = high school 2 = community college 3 = college 4 = art school
3a.	Number of years artistically employed.	0 = 0 <1 yr = 1 1 yr = 2 2 yrs = 3 3-4 yrs = 4 5-8 yrs = 5 10-18 = 6 19+ = 7
3b.	Dimensionality of artistic occupation.	1 = two-dimensional flat work, i.e., painting, drawing, etc. 2 = three-dimensional, i.e., sculpture, flower arranging, stage sets, and so on
4.	Art volunteer experience.	1 = administrative capacity 2 = design related 3 = art production related 4 = teaching

Appendix A (cont'd)

Item no.	Description	Code
5a.	Organization granting an art award (values ordered from lowest to highest level).	0 = no award 1 = high school/hobby/club/newspaper 2 = college 3 = art school 4 = museum
5b.	Highest place awarded in an art contest.	0 = no award 1 = fourth place 2 = third place 3 = second place 4 = first place
5c.	Number of art awards.	Coded in a continuous fashion
7.	How often do you visit a classical art museum?	1 = 1; 2 thru 4 = 2; 5+ = 3
8.	How often do you visit a contemporary art museum?	1 = 1; 2 thru 4 = 2; 5+ = 3
9.	Number of artistically oriented magazines read on a regular basis.	1 to 5 coded in a continuous fashion > 5 = 5
10.	Number of designs developed for projects.	Coded in a continuous fashion
11.	Total number of hobbies and other art activities such as membership in art guilds and service as an art volunteer.	Coded in a continuous fashion

SPSS item codes: 1 = Q1AR; 2a = Q2YRSR; 2b = Q2BR; 2c = Q2DR; 3a = Q3YRSR; 3b = Q3CR; 4 = Q4F; 5a = Q5AR; 5b = Q5DR; 5c = Q5ER; 7 = Q7R; 8 = Q8R; 8b = TOTMUS; 9 = MAG; 10 = Q10H; 11 = TOTHOBF. Filename = AJOPRG1.SYS/DIR ARTIST

Appendix B: *Correlations Not Corrected for Attenuation*

Table 11

Attenuated Correlations Between the Artistic Judgment Tests and the Standard Foundation Battery

Worksample[b]	DJT	VDT-SIM	VDT-UNI	PA-C	PA-.67	VAST	Relia.
Number Checking				07		10	96
Color Perception							NA
Ideaphoria	09	10				10	97
Foresight							97
Inductive Reasoning		08	06			11	84
Analytical Reasoning	14	13				18	65
Number Series						23	87
Wiggly Block	13	11				14	73
Paper Folding	19	15		-08		15	82
Personality	-10	-12		07			89
Tonal Memory					07	17	92
Pitch Discrimination	09	08	07		08	14	80
Rhythm Memory			12			15	73
Memory for Design	12	15	12		06	14	80
Silograms	09	12				08	92
Number Memory							82
Observation							62
Finger Dexterity							86
Tweezer Dexterity							93
English Vocabulary	22	23					96
Math. Vocabulary							NA
Reading Efficiency							73
Writing Speed							NA
Reliability	89	95	88	76	78	66	

Note. Leading decimals omitted. Table displays only correlations significant at the .01 level. *N*s range from 1,380 to 1,548, except for Mathematics Vocabulary, for which *N* = 890. All correlations partialled for sex and age. The correlations corrected for attenuation are shown in Table 2.

[b]Notation for artistic judgment tests: DJT (Design Judgment Test), VDT-SIM (Visual Designs Test-Simplicity), VDT-UNI (Visual Designs Test-Uniformity), PA-C (Proportion Appraisal: Consensus scoring), PA-.67 (Proportion Appraisal: .67 scoring), VAST (Visual Aesthetic Sensitivity Test).

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Table 12

Attenuated Correlations Between the Artistic Judgment Tests and the COPS Interest Scales (High School Form)

COPS scales[a]	DJT	VDT-SIM	VDT-UNI	PA-C	PA-.67	VAST
Science-Professional						
Science-Skilled						
Technology-Professional		05	10	-13		
Technology-Skilled						
Clerical	-11	-13		13		
Consumer-Electronics						
Arts-Professional	23	14				
Arts-Skilled	17	12				
Outdoor						
Service-Skilled				11		
Service-Professional						
Business-Skilled						
Business-Professional						
Communication	23	11		-12		
Reliability	89	95	88	76	78	66

Note. Leading decimals omitted. Pairwise *N*s range from 293 to 350. Table presents only correlations significant at .01. All correlations controlled for sex and age. The correlations corrected for attenuation are shown in Table 7.

[a]Notation for artistic judgment tests: DJT (Design Judgment Test), VDT-SIM (Visual Designs Test Simplicity), VDT-UNI (Visual Designs Test Uniformity), PA-C (Proportion Appraisal: Consensus scoring), PA-.67 (Proportion Appraisal: .67 scoring), VAST (Visual Aesthetic Sensitivity Test).

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Table 13

Attenuated Correlations Between the Artistic Judgment Tests and the COPS Interest Scales (College Form)

COPS scales[a]	DJT	VDT-SIM	VDT-UNI	PA-C	PA-.67	VAST
Science-Medical-Life						07
Science-Physical						
Technology-Electrical						
Technology-Mechanical	09					
Technology-Civil	09					
Outdoor-Nature	09				-08	
Outdoor-Agribusiness						
Business-Finance	-09	-10				
Business-Management		-08				
Computation						
Communication-Written	12	06		-07	-06	
Communication-Oral		-07				
Arts-Performing	11			-06		
Arts-Design	22					
Service-Instructional		-07				
Service-Social		-06	-07			
Reliability	89	95	88	76	78	66

Note. Leading decimals omitted. Pairwise *N*s range from 1,174 to 1,686. Table displays all correlations significant at .05 or greater. All correlations controlled for sex and age. The correlations corrected for attenuation are shown in Table 8.

[a]Notation for artistic judgment tests: DJT (Design Judgment Test), VDT-SIM (Visual Designs Test Simplicity), VDT-UNI (Visual Designs Test Uniformity), PA-C (Proportion Appraisal - Consensus scoring), PA-.67 (Proportion Appraisal - .67 scoring), VAST (Visual Aesthetic Sensitivity Test).

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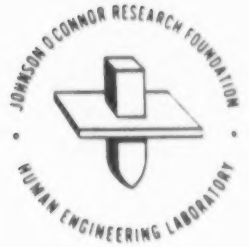
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